Study of $K_s^0 - K_s^0$ correlation functions in 158A·GeV Pb+Pb central collisions

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Two-particle correlation function[1] is one of the most important tools in studying the collision dynamics for heavy ion physics.[2] Information on the space-time evolution of the collision is inferred by analyzing the correlation functions.[3] Here, we report the first analysis of the two neutral Kaon ($K_s^0 - K_s^0$) correlation functions in high energy heavy ion collisions. There are several advantages to study K_s^0 correlation functions[4]: (i) The dynamic origin of Kaons is much cleaner than that of pions. For example, the resonance decay contribution is smaller for Kaons than for pions; (ii) In a hadron gas, the interaction cross sections of Kaons is smaller than that of pions. With less final state interaction, the earlier stage information may obtained from study the K_s^0 HBT effect; (iii) There is no Coulomb interaction which modifies the correlation function.

The experimental correlation function C_2 is defined as:

$$C_2(q_{inv}) = \frac{N_{tr}(q_{inv})}{N_{bk}(q_{inv})}$$

where $q_{inv} = \sqrt{-(p_1^\mu - p_2^\mu)^2}$ is the invariant momentum difference. N_{tr} is the true two-particle distribution constructed from particles from the same event and N_{bk} is the background two-particle distribution that is obtained by mixing particles from different events.

The NA49 is a large acceptance TPC experiment which is particularly suitable for K_s^0 reconstruction[5]. The data were taken with a special experimental configuration with the target mounted outside the magnetic field.[6] In the present analysis about 240k central events ($\sigma_{trig}/\sigma_{geom} \approx 7\%$) of $158AGeV$Pb+Pb collisions were used in this analysis. After optimization of the background and kinetic cuts, the preliminary correlation function as a function of the q_{inv} is shown in figure 1. As shown in the figure, about 5700 true Kaon pairs were used for the correlation function. It is clear that the analysis is limited by statistics. In order to increase the K_s^0 candidates, more detailed study on the cuts is underway.
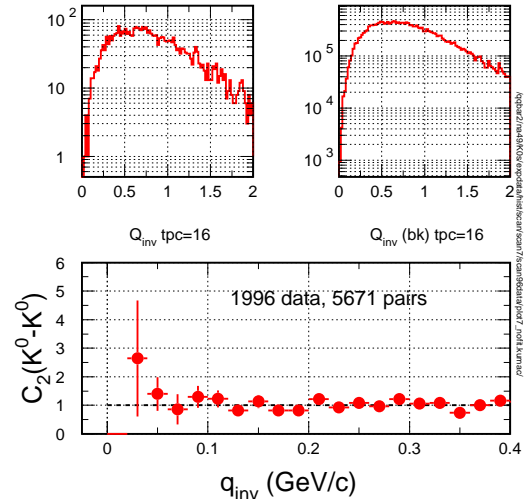

Figure 1: *The NA49 preliminary $K_s^0 - K_s^0$ correlation function C_2 as a function of the q_{inv}. N_{tr} and N_{bk} distributions are shown in the top-left and top-right plots, respectively.*

Footnotes and References

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[1] For two identical Bosons, it is often called the HBT effect.

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Footnotes and References

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